PURCHASE SPECIFICATION
LIGHT EMITTING DIODE (LED) SIGNAL MODULES
(Yellow)

This specification is for the purchase of LED Traffic Signal Modules (herein referred to as modules) in the following configurations: the 300 mm Yellow circular sections, the 200 mm Yellow circular sections, and the 300 mm Yellow arrow sections.

All devices must meet the general specifications of the Transportation Electrical Equipment Specifications (TEES), Chapter 1--General Specifications, as well as the following specification. Incase of conflict, this specification shall govern over the TEES, Chapter 1.

1 Glossary

Wherever the following terms or abbreviations are used, the intent and meaning shall be interpreted as follows:

	25°C	74°C
300 mm circular	25.0 W	30.0 W
200 mm circular	20.0 W	25.0 W
300 mm arrow	20.0 W	25.0 W

2.5.2 Operation Voltage

2.5.2.1 The modules shall operate from a 60 HZ ±3 HZ AC line over a voltage ranging from 95 volts to 135 volts. The fluctuations of line voltage shall have no visible effect on the luminous intensity of the indications.

2.5.2.2 Operating voltage of the modules shall be 120 VAC. All parameters shall measured at this voltage.

2.5.3 Power Factor
The LED signal module shall have a power factor of 0.90 or greater.

2.5.4 THD
Total harmonic distortion (current and voltage) induced into an AC power line by a LED signal module shall not exceed 20 percent.

2.5.5 Surge Suppression
The signal module on-board circuitry shall include voltage surge protection to withstand high-repetition noise transients as stated in Section 2.1.6 of NEMA Standard TS-2, 1992.

2.5.6 The LED circuitry shall prevent perceptible flicker to the unaided eye over the voltage range specified above.

2.5.7 All wiring and terminal blocks shall meet the requirements of Section 13.02 of the ITE Publication: Equipment and Material Standards, "Vehicle Traffic Control Signal Heads".

2.5.8 Compatibility
The modules shall be operationally compatible with currently used controller assemblies (solid state load switches, flashers, and conflict monitors). Review TEES Chapters 3 and 6 for specifications on these devices.

2.5.8.1 When a current of 20 mA AC (or less) is applied to the unit, the voltage read across the two leads shall be 15 VAC or less.

2.5.9 The modules and associated on-board circuitry must meet Federal Communications Commission (FCC) Title 47, SubPart B, Section 15 regulations concerning the emission of electronic noise.

2.6 Photometric Requirements

2.6.1 The minimum initial luminous intensity values for the modules shall be as defined in VTCSH Part 2, Section 4.1 for YELLOW indications at 25°C.

2.6.1.1 The modules shall meet or exceed 85 percent of the standard light output values found in the ITE publication: Equipment and Material Standards, VTCSH Part 2 for Yellow color signal throughout the useful life based on normal use in a traffic signal operation over the operating temperature range.

The following specification requirements apply to the Type 1 module only. All general specifications apply unless specifically superceded in this section.

3.1 Type 1 modules can be manufactured under this specification for the following faces:

3.1.1 300 mm yellow circular

3.1.2 200 mm yellow circular

3.1.3 300 mm yellow arrow

3.2 Physical and Mechanical Requirements

3.2.1 The module shall fit into existing traffic signal section housings built to the specifications detailed in ITE Publication: Equipment and Material Standards, "Vehicle Traffic Control Signal Heads", with the reflector and lamp socket remaining in place, and without modification to the housing.

3.2.2 Each Type 1 module shall be designed to be installed in the doorframe of a standard traffic signal housing. The Type 1 module shall be sealed in the doorframe with a one-piece EPDM (ethylene propylene rubber) gasket.

3.2.3 The maximum weight of a Type 1 module shall be 1.8 kg (4 lbs.).

3.3 Construction

3.3.1 Each Type 1 module shall be a sealed unit to include all parts necessary for operation (a printed circuit board, power supply, a yellow lens and gasket, etc.), and shall be weather proof after installation and connection.

3.3.2 Conductors
Two secured, color coded, 914 mm (36 in) long 600 V, 20 AWG minimum, jacketed wires, conforming to the National Electric Code, rated for service at +105°C, are to be provided for electrical connection for each Type 1 LED signal module. Conductors for Type 1 modules shall be 1-m in length, with quick disconnect terminals attached and shall conform to Section 86-4.01C, "Electrical Components," of the Standard Specifications.

3.3.3 If specified in the purchased order, the module will be equipped with an adapter that will screw into the medium base, lamp socket. The adapter shall be able to accept the quick disconnect terminals at the end of the conductors for the module. The electrical contacts of the adapter shall be made of brass.

3.4 Lens

3.4.1 The lens of the Type 1 module shall be integral to the unit, shall be convex with a smooth outer surface and made of plastic or of glass.

3.4.2 The lens may be tinted or may use transparent film or materials with similar characteristics to enhance ON/OFF contrasts.

3.4.2.1 The use of tinting or other materials to enhance ON/OFF contrasts shall not affect chromaticity and shall be uniform across the face of the lens.

6 Quality Assurance

6.1 The modules shall be manufactured in accordance with a manufacturer quality assurance (QA) program. The QA program shall include two types of quality assurance: (1) design quality assurance and (2) production quality assurance. The production quality assurance shall include statistically controlled routine tests to ensure minimum performance levels of The modules built to meet this specification, and a documented process of how problems are to be resolved.

6.2 QA process and test results documentation shall be kept on file for a minimum period of seven years.

6.3 LED signal module designs not satisfying design qualification testing and the production quality assurance testing performance requirements described below shall not be labeled, advertised, or sold as conforming to this specification.

6.4 Design Qualification Testing

6.4.1 Design Qualification Testing shall be performed by the manufacturer or an independent testing lab hired by the manufacturer on new LED module designs, and when a major design change has been implemented on an existing design. A major design change is defined as a design change (electrical or physical) which changes any of the performance characteristics of the module, results in a different circuit configuration for the power supply, or changes the layout of the individual LED's in the module.

6.4.2 A quantity of two units for each design shall be submitted for Design Qualification Testing.

6.4.2.1 Test units shall be submitted to Caltrans after the manufacturer's testing is complete.

6.4.2.2 Manufacturer's testing data shall be submitted with test units for Caltrans verification of Design Qualification Testing data.

6.4.3 Burn In.
The sample modules shall be energized for a minimum of 24 hours, at 100 percent on-time duty cycle, at a temperature of +74°C (+165°F) before performing any design qualification testing.

6.4.4 Any failure of the module, which renders the unit non-compliant with the specification after burn-in, shall be cause for rejection.

6.4.5 For Design Qualification Testing, all specifications will be measured including, but not limited to:

6.4.5.1 Rated Initial Luminous Intensity.
Measured over the operating temperature range.

6.4.5.2 Chromaticity (Color).
Measured over the operating temperature range.

6.4.5.3 Electrical.
All specified parameters shall be measured and used for quality comparison of production quality assurance on production modules. (rated power, etc)

6.4.5.4 Equipment Compatibility.
Modules shall be tested for compatibility with the controller unit, conflict monitor, and load switch. Each signal module shall

6.6.2 Random sample testing should be completed within than 30 days after delivery to the specified location on the purchase order.

6.6.3 Circular modules shall be tested according to California Test No. 604, and as described herein.

6.6.4 Pedestrian modules shall be tested according to California Test No. 606 and as described herein.

6.6.5 All optical testing shall be performed with the module mounted in a standard traffic signal section or in a standard Type "A" Pedestrian Housing, but without a visor or hood attached to the section or housing.

6.6.6 The number of units tested (sample size) shall be determined by the quantity of each model in the shipment. The sample size shall conform to ANSI/ASQC Z1.4. The Caltrans METS shall determine the sampling parameters to be used for the random sample testing.

6.6.7 All parameters of the specification may be tested on the shipment sample.

6.6.8 Acceptance/Rejection of the shipment shall conform to ANSI/ASQC Z1.4 for random sampled shipments.

7 Warranty

The manufacturer shall provide a written warranty against defects in materials and workmanship for the modules for a minimum period of 48 months after acceptance of the modules. Replacement modules shall be provided promptly after receipt of modules that have failed at no cost to the State. All warranty documentation shall be given to the TransLab prior to random sample testing.